

Ex: One area of study for demographers is the residential movement of people from a city to its surrounding suburbs and vice versa. For one region, they find that approximately 7% of the city population moves to the suburbs and about 5% of the suburb population moves to the city. In 2000, there were 800,000 residents in the city and 500,000 residents in the suburbs. [Ignore other factors that influence population size.]

- (a). Use  $C_n$  and  $S_n$  to represent the city and suburban populations. Set up a discrete dynamical system to model the population migration.

- (b). Find the equilibrium value(s).

[Class discussion.]

- (c). Iterate the DDS for the given IC's to see what happens over time. Does the equilibrium appear to be stable?

- (d). Play around with different IC's and see if the long-term behavior changes? Is the system sensitive to IC's?

- (e). Play around with different coefficients? Does the *qualitative* behavior change?

**Homework:**

- Read Section 1.4 Examples and Discussion.
- Section 1.4, p. 52: #4, 5, 6 [For each of these problems, also find the equilibrium values before doing part (b).]  
[Due: Tuesday, March 07]

**Project**  
**Battle of Trafalgar, revisited**  
[Due: Thursday, March 9]

For this project, you will examine the problem given in Section 1.4, p. 54, #3. Read and understand Example 2 The Battle of Trafalgar on pages 40-43. Use this example as the starting scenario for this project. In addition, to the three parts (a, b, & c) given in the problem, you should also address the question of what ratio of the loss percentages for each fleet (e.g. 10%-10%, 15%-5%, etc.) will result in the smaller fleet defeating the larger fleet in a simple head-on engagement and with the divide-and-conquer strategy. You should explain why if the loss percentage for one fleet goes down, it is realistic for the loss percentage to go up for the other fleet.

This project should be several word-processed pages (single spaced - double between paragraphs). Include any necessary graphs and tables (numbered and with captions). You should follow the general guidelines given in the Project Report Format. Remember to include headings and subheadings as they seem appropriate.